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PROVINCE OF ALBERTA

MENT OF AGRICULTURE
FIELD CROPS BRANCH

ALBERTA'S WEED PROBLEM

BULLETIN No. 1

Published by direction of the
HON. GEORGE HOADLEY, Minister of Agriculture



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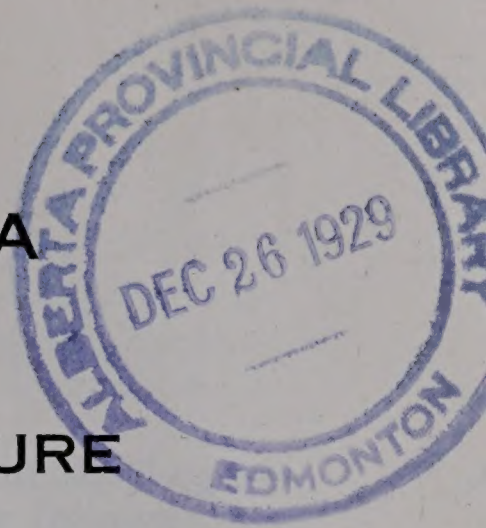
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PROVINCE OF ALBERTA

DEPARTMENT OF AGRICULTURE

FIELD CROPS BRANCH



ALBERTA'S WEED PROBLEM

BULLETIN No. 1

Noxious Weeds Act of Alberta; Organized Effort to Control Weeds;
General Principles of Eradication; Description, Dissem-
ination, Eradication and Control of a Few of
Alberta's Most Dangerous Weeds

By W. J. STEPHEN

FIELD CROPS COMMISSIONER, ALBERTA DEPARTMENT
OF AGRICULTURE

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PREFACE

Bulletin No. 1 is intended briefly to outline the efforts which are being put forth in the Province to combat noxious weeds. A brief description of a few of the most troublesome noxious weeds, together with methods of control and eradication, is also given. All control methods included herein are based on actual experiments conducted in the Province by farmers and scientific agriculturists.

THE NOXIOUS WEEDS ACT

Being Chapter 63 of the Revised Statutes of Alberta, 1922,
with Amendments to April 8, 1926

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Alberta, enacts as follows:

SHORT TITLE

1. This Act may be cited as "*The Noxious Weeds Act*."

INTERPRETATION

2. In this Act, unless the context otherwise requires—

- (a) "Department" shall mean the Department of Agriculture;
- (b) "Earthwork" shall mean any dump or heap of earth, or place from which earth has been removed;
- (c) "Inspector" shall mean any inspector appointed under this Act;
- (d) "Minister" shall mean the Minister of Agriculture;
- (e) "Noxious weeds" shall include tumbling mustard (*Sisymbrium altissimum*), hare's ear mustard (*Conringia orientalis*), common wild mustard (*Brassica sinapistrum*), ball mustard (*Neslia paniculata*), tansy mustard (*Sisymbrium incisum*), wormseed mustard (*Erysimum cheiranthoides*), false flax (*Camelina sativa*), shepherd's purse (*Capsella bursa-pastoris*), red root (*Amarantus retroflexus*), Canada thistle (*Cnicus arvensis*), stink weed (*Thlaspi arvense*), Russian thistle (*Salsola kali* v. *Tragus*), ragweed (*Ambrosia trifida*), wild oats (*Avena fatua* and *A. strigosa*), Russian pigweed (*Axyres amaran-toides*), blue bur (*Echinosperrum lappula*), tumble weed (*Amar-antus albus*), purple cockle, perennial sow thistle (*Sonchus arvensis*, L.), blue lettuce (*Lactuca pulchella*, D.C.), cockle bur (*Xanthium strumarium*, L.), common barberry (*Berberis vulgaris*), and toad flax (*Linaria vulgaris*, Hill);
- (f) "Occupant" shall mean a person occupying or having the right to occupy any land;
- (g) "Owner" shall include every person who has any estate or interest in land or grain, or who has any right to be vested with such estate or interest; and for the purposes of this Act and with respect to all lands within the boundaries of a city, town, village or municipal district, shall include the council of such city, town, village, or municipal district;
- (h) "Thresher" shall mean any person in possession or charge of a threshing machine;
- (i) "Screenings" shall mean material removed from grain through cleaning to bring it up to the standards defined for grades under *The Canada Grain Act*.

INSPECTORS AND OTHER OFFICERS

3. The Minister may from time to time appoint such inspectors and other officers as may be required to carry out the provisions of this Act, fix their remuneration and define their duties.

DUTY OF OWNER OR OCCUPANT OF LAND

4.—(1) Every owner or occupant shall destroy all noxious weeds on the lands he owns, occupies, or has the right to occupy, and on the area between the boundaries of the said lands and the centre line of all contiguous roads and road allowances, and if he makes default in so doing he shall be liable on summary conviction before a justice of the peace to a penalty of not less than five dollars and not exceeding fifty dollars and costs.

(2) White clover, timothy, or western rye grass or a mixture thereof, shall be sown and cultivated by railway and irrigation companies on all earthworks made by them.

DESTRUCTION OF WEEDS

5.—(1) Any inspector may enter upon any land to inspect it for noxious weeds and any person obstructing him in the discharge of his duty shall be guilty of an offence and liable on summary conviction to a penalty not exceeding twenty-five dollars and costs.

(2) Any inspector finding noxious weeds growing in any grain or hay crop may notify the owner—

(a) to pull by hand or cut and burn or plow under such crop or any part thereof within a stated time; or

(b) to burn the straw or screenings or both from any crop or part thereof within five days after it is threshed.

6. Any inspector finding noxious weeds growing on occupied lands shall notify the occupant thereof to destroy such weeds within five days from the date of such notification.

7. Any inspector finding noxious weeds growing on unoccupied lands shall notify the owner either personally or by registered letter addressed to his last known address, if any, to destroy such weeds within five days of such notice.

8. Any inspector finding noxious weeds growing on any railway fire-guard, right-of-way, or any other earthwork, or on any unoccupied lands owned by or forming part of the land grant to any railway company shall notify the roadmaster or foreman of that section, or the nearest station agent either personally or by registered letter, to destroy such weeds within five days from the date of such notice.

9. Any inspector finding noxious weeds growing in or upon any ditch, or other earthwork, or upon the right-of-way of any irrigation company shall notify the manager, superintendent or ditch rider of such company, or the owner or controller of any ditch or lateral ditch, either personally or by registered letter, to destroy such weeds within five days from the date of such notice.

10. Any person to whom notice has been duly given under any of the preceding sections, who neglects to carry out the directions contained therein shall be guilty of an offence and on summary conviction thereof shall be liable to a penalty of not less than five and not exceeding fifty dollars and costs.

11. In case noxious weeds are not cut down or otherwise destroyed on any land pursuant to any notice given by an inspector under this Act or in case the name or address of the owner of such land is unknown, the inspector or any person or persons directed by him may forthwith enter upon the land with the necessary teams and implements and destroy such weeds in such manner as the inspector may see fit.

12.—(1) The amounts expended in the work performed under the next preceding section may be recovered from the owner or occupant of the land by action in the name of the Attorney General or the inspector or by distress by the inspector or his agents of any chattels on the land.

(2) Any such amount which has not been recovered from the owner or occupant before the first day of January next following its expenditure shall be added to and form part of the local improvement or municipal taxes upon such lands and it shall have the same effect on the land as if it were an original tax, and may be recovered by any of the methods available for the recovery of such taxes; and the amount so recovered shall be transmitted to the Provincial Treasurer and form part of the general revenue fund of the Province:

Provided that no sum in excess of two hundred dollars shall be charged in any one year against any one quarter-section of land.

(3) Upon the secretary of a local improvement district or municipal district receiving notice from the Department of Municipal Affairs of any amount to be charged under the next preceding subsection against any parcel of land in his district, he shall enter the said amount against the said land and, until it is paid, enter it in all returns made by him in the same manner as local improvement or municipal assessments.

(4) A certificate, purporting to be issued by the Department of Municipal Affairs, to the effect that the amount named therein has been expended during any year for the destruction of noxious weeds upon any area of land described therein shall be *prima facie* evidence that the amount named has been so expended.

SALE OR DISPOSAL OF GRAIN, ETC., CONTAINING WEED SEEDS

13. No person shall sell or keep for sale or offer to sell any grain screenings which contain more than three per centum by weight of noxious weed seeds capable of passing through a one-fourteenth inch perforated zinc screen, or containing more than one per centum by weight of mustard seed.

14.—(1) Save as is hereinafter provided by this Act, no person shall buy or sell, or keep for sale or offer to buy or sell, or remove from any grain elevator, mill or warehouse, any grain screenings which contain more than three per centum by weight of noxious weed seeds, capable of passing through a one-fourteenth-inch perforated zinc screen, or more than one per centum by weight of mustard seed, which grain screenings are hereinafter referred to as grade B screenings.

(2) All screenings other than grade B screenings shall be known as class A screenings, and may be bought or sold or removed from any grain elevator, mill or warehouse for the purpose of feeding the same to live stock, if the same are contained in closely woven and securely tied sacks, but if the screenings are to be fed to live stock, they must be fed within properly constructed feed yards, which shall be subject to inspection by weed inspectors.

(3) Grade B screenings may be bought, sold or removed from any grain elevator, mill or warehouse by a dealer or other person, provided that such dealer or other person holds a permit from the Minister, and subject to such conditions as may be set out in the permit.

(4) The said permit shall be issued in duplicate, and both copies of the permit shall be delivered by the purchaser to the manager of any grain elevator, mill or warehouse, dealer or other person from whom a purchase is made, and one of the copies shall be forwarded by the latter to the Minister within thirty days of the purchase.

(5) All grade B screenings must be kept in tightly constructed buildings by every such manager, dealer or other person holding a permit, until they are delivered for the purpose of feeding.

(6) All grade B screenings not so kept shall be burned by the manager, dealer or other person in whose possession they are, in such manner as to prevent their being scattered by the wind, live stock or any other agency.

(7) The Minister may, at his discretion, prescribe different forms of permit, and the conditions upon and times for which permits are to be issued.

(8) Lists of the persons to whom screenings are sold shall be furnished monthly to the Minister by the managers of grain elevators, mills or warehouses, at the same time stating the class of screenings sold in each case and the quantities.

(9) For the purposes of this section, seeds of lamb's quarters (*Chenopodium album*) shall be considered noxious weeds:

Provided that this section shall not apply to the removal, by a farmer, from a grain elevator, mill or warehouse, of screenings from grain produced upon his farm.

15. No person shall place outside any mill, elevator or grain warehouse, except in a securely constructed building, shed or covered bin, any matter containing the seeds of noxious weeds without first having destroyed the germinating powers of such seeds.

CLEANING OF THRESHING MACHINES AND GRAIN

16. Every thresher shall thoroughly clean his machine, both inside and out, and all his wagon racks, immediately after threshing at each setting and before removing the machine or any part thereof to another setting.

17. Every thresher shall clean the grain threshed by him, and when delivered to the owner it shall contain not more than one hundred seeds of noxious weeds other than wild oats, to every thousand of grain, and all screenings containing seeds of noxious weeds shall be either destroyed by the owner within five days after the grain is threshed or removed in closely woven and securely tied sacks.

18. Every thresher shall display in a prominent place upon his machine a card containing this and the two next preceding sections, which card shall be furnished free upon application to the Department.

PENALTIES

19. Every inspector or other officer who neglects to perform any duty placed upon him by this Act shall in respect of each instance of neglect be guilty of an offence, and liable on summary conviction thereof to a penalty not exceeding twenty-five dollars and costs.

20. Violation of any provision of this Act for which no penalty is provided shall be an offence and the offender shall on summary conviction thereof be liable to a penalty of not less than five and not more than fifty dollars and costs.

ORGANIZATION

A brief outline of the organized effort that is being put forth in the Province to combat weeds may serve as an awakening to those who have not previously considered the weed menace, and at the same time stimulate to greater activity those who have not given it the consideration it deserves.

To successfully combat weeds requires the fullest co-operation of each and every person in the Province. Everyone should learn to recognize the weeds on the noxious weeds list at their various stages of growth.

Having learned to recognize the noxious weeds it is then imperative to know their habits of growth, how they are disseminated, and how they may be controlled and eradicated.

(A) THE GOVERNMENT

The Department of Agriculture annually divides the Province into districts and in each district a Field Supervisor is located. The Supervisors' duties are numerous, and their territories are of considerable extent. Each one has a district headquarters; and can be reached, in a few days at most, by letter or telephone.

The Supervisors attempt to make a weed survey of their district and to know the location of the most dangerous weeds. They solicit the co-operation of municipal councils, municipal weed inspectors, towns, cities, railway authorities, irrigation companies, schools, agricultural societies, U.F.A. locals, other organizations not mentioned, and private individuals. They direct experimental work with farmers on weed control. The results of a number of their experiments, while not absolutely conclusive, are contained in this bulletin. All Field Supervisors report that they receive the heartiest co-operation. Seldom is it found necessary to enforce the provisions of The Noxious Weeds Act.

Meetings are held frequently to discuss weeds and other phases of agriculture. Moving pictures relative to weed identification, and systems of farming that will control and eradicate weeds, have been prepared by the Motion Picture Branch of the Department of Agriculture and the Field Crops Branch. These pictures are frequently shown, and prove instructive and entertaining.

Noxious Weed Posters have been prepared and are available, free of charge, from the Field Crops Branch. These colored posters should be conspicuously displayed in every school house, community hall, and other places of meeting. They give an exact representation of the weed described, together with suggested methods of eradication.

Farmers, councillors, weed inspectors, and others are invited to get in communication with the nearest Field Supervisor, or write to the Field Crops Branch, relative to weed identification, weed control, or weed legislation.

(B) MUNICIPAL COUNCILS

Municipal Councils are respectfully reminded of Section 189 (1) of The Municipal Districts Act, which in effect gives Municipal Councils the power to appoint such weed inspectors as are required to carry out and enforce the provisions of The Noxious Weeds Act within their Municipal Districts. Every inspector so appointed has his powers and duties clearly defined in the Act.

Councils are urged to appoint their weed inspectors early in the season. It is preferable to appoint by the year, although the inspector may be required to work only a short period at a time. By so doing, there is legal authorization at all times for action when necessary.

Councils would be well advised to hold weed meetings in each division several times during the year. Government Field Supervisors will assist at these meetings during the summer, if desired. They are educational, and tend to stimulate interest and co-operation on the part of all the farmers of the district.

The secret of successful weed control is EDUCATION AND CO-OPERATION. Legal proceedings should be the last resort. Those in charge of weed work, however, should make it clearly understood that the weed laws of the Province must be respected and enforced if necessary.

(C) MUNICIPAL WEED INSPECTORS

Municipal Weed Inspectors should have neither friends nor enemies. They should be men of sound judgment and good practical knowledge. Their objective should be the building up of a strong community spirit, aiming to keep the land clean and at the same time farm profitably. Every inspector should make a weed survey of his district, and at all times be prepared to give practical advice to those needing it.

At the expiration of their terms of office, and at least once each year in the autumn, inspectors should leave with their municipal secretaries a detailed statement dealing with work accomplished, work commenced, their weed survey, recommendations for eradication of weeds, and suggestions for the year following.

Municipal Weed Inspectors would be well advised to consult frequently with their nearest Field Supervisor, who may be able to render much needed assistance.

(D) TOWNS AND CITIES

Practically all the towns and cities of the Province are showing a reasonable amount of co-operation, and doing considerable to cope with the weed menace. However, in many places there is yet a great deal to be done. Unless the weeds in these centres are kept from drifting and blowing to adjoining areas, we shall always have

trouble keeping the farms clean. If the councils could obtain the co-operation of all citizens, weeds would soon disappear. It is the duty of every resident in our towns and cities to do everything in his power to stamp out, and keep stamped out, all noxious weeds. By so doing, much will be done to improve agricultural conditions.

All councils should annually appropriate funds for weed eradication on their vacant lands, and to appoint weed inspectors to compel citizens who are negligent in their duty to destroy the weeds on the areas they occupy and have a right to occupy.

(E) RAILROAD AND IRRIGATION COMPANIES

According to The Noxious Weeds Act, railroad and irrigation companies have certain obligations to carry out regarding the destruction of noxious weeds. It is gratifying to note the effort that is being put forth by these companies to comply with the Act. There is still much to be done. Weed Inspectors and others interested in weed control should at once notify the Road Master, Station Agent, or Section Foreman of the presence of any noxious weeds that have been overlooked on railway property. The Manager, Superintendent, or Ditch Rider of any irrigation company, or the owner or controller of any ditch or lateral ditch, should be promptly advised of the presence of noxious weeds that have escaped attention.

(F) SCHOOLS AND LOCAL ORGANIZATIONS

Children in both public and high schools should be taught to recognize the noxious weeds during their various stages of growth. They should also be taught how to control and eradicate them. Children grow up with this information, and in later life many of them will put their knowledge into practice.

In many districts local organizations, such as Agricultural Societies and U.F.A. Locals, have done much to bring before the people the seriousness of the weed menace. This continued co-operation is solicited.

THE DUTY OF THE FARMER

There are two classes of farms:

- (a) The clean farm.
- (b) The farm polluted with weeds.

The farmer with the clean farm should aim to prevent weeds from coming in.

The man with the weedy farm should prevent weeds from spreading and he should put forth his best endeavors to clean his land.

To intelligently cope with the weed menace, every farmer must be able to—

- (a) Identify the noxious weeds.
- (b) Know how they spread.
- (c) Know their habits of growth.
- (d) Know how to control and eradicate them.

HOW WEEDS SPREAD

(a) *Man* himself often brings in weed seeds in seed, feed, packing material, machinery, and livestock.

Sowing grain that is infested with weed seeds is a common practice. All seed should be thoroughly cleaned before seeding. If unable to rid it of weeds, new clean seed should be purchased.

Settlers, when moving from one district to another, should exercise care to thoroughly clean off all machinery and other effects, and not ship hay or other feed that contains foul seeds. Many clean districts have been polluted in this way. Wire fencing, when taken down for shipment to other districts, should be freed from weeds that cling to it. This may be done by means of an oil torch.

The purchase of screenings, and the careless handling of them, has scattered weeds along the highways and on to clean fields. Prospective purchasers should read carefully Sections 13, 14, and 15 of The Noxious Weeds Act.

Threshing machines, stook wagons, and farm machinery spread weeds from one farm to another.

Ranchers, railway contractors, and road gangs have been responsible for the importation of weed seeds in feed, such as hay and oats which have been brought in from other countries and provinces.

(b) *Animals*, including both domestic and wild, with the exception of sheep, in the processes of mastication and digestion have not the power to destroy the germination of many of the weed seeds; and so they are passed through the digestive organs and spread about the fields. In cases where it is found necessary to feed grain containing weed seeds, the stock should be kept in enclosures, and the manure should be thoroughly rotted before being spread on the land. In many cases it is wise to burn the manure.

Stock should not be allowed to eat the screenings left by threshing machines, or to eat weedy straw stacks, and then be allowed to run at large. The screenings should be gathered at once after threshing, and either burnt or finely ground or cooked before feeding.

Sheep are excellent weed controllers. A few sheep should be kept on every farm. They pack and clean the summerfallows, keep the lanes, fence lines, and building sites free from weeds and other growth.

(c) *Water* (in the form of streams, rivers, irrigation ditches, and canals) carries weed seeds from one district to another. All banks should be kept free from weeds. New earth works should be levelled down when made, and be periodically cultivated or sown to perennial grasses. Brome grass, although sometimes objected to because of its persistent root system, sweet clover (a biennial) and alfalfa are excellent to sow on irrigation banks and the banks of

rivers and streams. A mixture of white clover or alsike, timothy, and Western Rye grass is a very safe mixture to use at all times to keep weeds down on the banks of running water. This mixture is not as effective as Brome. Banks that have been seeded down should be cut for hay before weed seeds form, or they should be pastured closely with sheep or other live stock, except hogs. Hogs root and destroy the stand of grass. Under no consideration should weeds on ditch banks be allowed to go to seed.

(d) *Wind* carries seeds of Perennial Sow Thistle, Canada Thistle, and Blue Lettuce for many miles. Tufts of silky hairs are attached to the seeds, which aid the wind to carry them great distances. Plants of Russian Thistle, Tumbling Mustard, and Tumble Weed break off if allowed to mature, and roll before the wind, depositing seeds as they go. Fence wires should never be lifted to allow such weeds to pass through. Farms should be well fenced at all times to catch any such tumbling weeds, which should be pulled out and burnt.

CLASSIFICATION OF WEEDS

Weeds belong to one of the following classes: annuals, winter annuals, biennials, and perennials.

Annuals are those that grow from seed, blossom, produce seed, and die the same season. They usually have small fibrous roots, and produce a large quantity of seed. Examples of these are Wild Oats, Wild Mustard, Russian Thistle, Russian Pigweed, Lamb's Quarters.

Winter annuals are those that germinate in the fall of the year, remain green all winter, and continue their growth in the spring from where they left off the fall before. They complete their life within one year. The following are winter annuals as well as annuals: Stinkweed, Hare's Ear Mustard, Ball Mustard, Tumbling Mustard, False Flax, Wormseed Mustard, Blue Bur, Shepherd's Purse.

Biennials are those that require two seasons to complete their growth. The first season is usually spent in producing a small plant and storing up nourishment. The second year is when the flowers and seeds are produced. Grey and Green Tansy Mustard and Burdock are examples.

Perennials are those that continue to grow from year to year. They propagate both by seed and underground root stocks that often go out great distances from the parent plant. There are shallow and deep rooted perennials. Canada Thistle, Perennial Sow Thistle, and Blue Lettuce have deep-rooted underground root stocks, while Quack Grass and Sweet Grass have shallow root stocks.

GENERAL PRINCIPLES OF ERADICATION

The following are a few of the general principles that have been found effective for the eradication of annuals, winter annuals, biennials, and perennials:

(a) *Annuals*:

1. Sow clean seed.
2. Never allow weeds to ripen seeds.

3. Plants that have matured seeds should be pulled at once and burnt.

4. Cultivating behind the binder, or as soon as possible after harvest, with a disk, spring-tooth cultivator, or straight-tooth cultivator, has a similar effect to skim plowing. Fairly large seeds such as Wild Oats and Ball Mustard may be plowed under two to three inches deep and with the proper amount of moisture and heat will germinate. Very fine seed or small seeds (such as Lamb's Quarters and Russian Pigweed) should not be covered more than an inch or an inch and a half. Fall plowing for the eradication of such weeds is ill-advised. Disking is better; it covers the seeds just lightly.

5. Skim plow two to three inches deep in the fall after harvest. This covers weed seeds, many of which germinate that fall, and are destroyed by the frost. Others will start the following spring, and these will be destroyed by cultivation before sowing the crop, or at the time of plowing for the summerfallow, which may follow.

6. Spring cultivation, when done early, covers weed seeds which germinate readily, and the young plants can later be killed by a further cultivation or plowing.

7. Light harrowing, after the crop is two to three inches high, pulls out many annuals. The crop may be harrowed two to three times until it is six inches high. Some grain will doubtless be pulled out; in which case a slightly heavier seeding may be advisable. Harrowing will pull out such plants as the Mustards, Stinkweed, and Russian Thistle, but will not affect Wild Oats.

8. The pasturing of livestock on weed-infested land, particularly on summerfallow land, is recommended. Sheep are the best weed scavengers.

9. Pull by hand plants that appear in the crop. Pull early. It is advisable to pull before any seeds have formed.

10. Spring or fall cultivation, followed by a well-worked summerfallow, will germinate a very large percentage of the weed seeds. The resultant plants are cut off by cultivation or eaten by livestock. Keep the summerfallow black until freeze-up.

If Wild Oats, however, are the major problem, the summerfallow should not be worked after September 1st, for the reason that Wild Oat seeds may be brought close to the surface that would not germinate in the fall, but will grow with the crop the following spring. Do no spring cultivation, for the same reason. Simply drill in the grain in the spring. To get the seed down to the proper depth it may be necessary to increase the pressure on the drill. By leaving the seeds buried, the grain crop will keep them well in control. For further information see article in this bulletin on Wild Oats.

11. Sow fall wheat or fall rye on land that has been summerfallowed from early spring. Annuals that grow in the crop will that fall be killed by frost. Others that germinate in the spring will probably not mature as soon as the crop.

12. Fall or spring cultivation followed by spring plowing and planting to a hoed crop. The hoed crop should be cultivated frequently to thoroughly clear of weeds. Corn or sunflowers, when grown on weedy land, should be planted in check rows. After the cultivator has been used, go through the crop with a hoe to cut out any weeds close to the plants that the cultivator failed to reach.

13. Seeding down to permanent grass mixtures followed by pasture and hay crops.

14. On irrigated land, seeding to alfalfa. Old alfalfa stands, when broken, usually are quite free of all annual weeds.

15. Seeding to sweet clover. The sweet clover is cut for hay or pastured before the weeds go to seed.

16. Barley sown heavily late in the spring, at from two and one-half to three bushels per acre, immediately after the ground has been cultivated to destroy all green growth, will usually germinate quickly, thereby getting a start on the weeds. The thick stand and quick maturity acts as a good smothering crop. After the barley is harvested follow by disking or other surface cultivation the same year. This will start a fresh crop of weeds.

Intensive and repeated summerfallow, to which there are objections, or a systematic rotation of crops in which grass and pasture crops are to be found, are (generally speaking) the two types of farming to follow if we wish to have our land free from annual weeds which are the chief cause of heavy dockage and decreased yields.

(b) *Winter Annuals:*

Winter annuals can be eradicated by the methods outlined for the eradication of annuals. If the winters are open, winter annuals often come into blossom; and produce seeds which very early, or when we are least expecting it, mature and re-seed. Constant vigilance is necessary for the rapid and complete eradication of winter annuals. The farmer who goes over his fields when systems of cultivation cannot be employed, and hand-pulls stray winter annuals will be well repaid. A good plan would be to gather all such plants in a sack, and burn them. Late fall cultivation is necessary, also the thorough working with a wide-shear cultivator, followed by the harrow in the spring. This should be done as early as possible, and again just before seeding.

(c) *Biennials:*

Biennials can be destroyed by plowing, hoeing, or pulling; preferably the first year of their growth, or early the second year. Fields badly infested should be summerfallowed.

(d) *Perennials:*

Perennials are very difficult to destroy. Canada Thistle, Perennial Sow Thistle, and Blue Lettuce will each be dealt with separately. These are the chief perennials causing us serious loss.

BURNING WEEDS

Stubble should be burnt as soon as it is dry enough. Seldom do we get it sufficiently dry to burn in the fall. The fire can be made to travel and spread by the use of the harrow.

Tumbling weeds, when ripe and dry, can be stopped from rolling by scattering straw on them, and burning. Roadsides, fields, and waste places can be cleaned up in this way. Fence lines should be freed of such weeds by pulling them out and burning.

The Weed Burner has been greatly improved the past few years. Its use in the fall of the year, as well as in the spring, to burn dry and semi-dry plants, is particularly valuable. The public is much interested in this machine. There is a great need for it.

PERENNIAL SOW THISTLE

(*Sonchus arvensis*, L.)

Perennial, introduced from Europe. Other English names are Field Sow Thistle, and Creeping Sow Thistle. Stems are one to five feet high, hollow, simple, with few leaves, and branching at top. The entire plant contains a bitter milky juice. Leaves six to twelve inches long, pointed, deeply cut, the lower divisions directed backward, clasping the stem with their heart-shaped base and edged with sharp spines. Flowers bright yellow, one and one-half inches across, in corymbs, closing in strong sunlight; the flower stalk and the scaly bracts surrounding the flower-heads bristly, covered with long glandular hairs. It flowers from July until late in the fall.

The seed is about one-eighth inch long, dark reddish brown, oblong, closely and deeply ridged lengthwise, the ribs wrinkled transversely, giving the seed the appearance of being ridged both ways, bearing at the top a tuft of white silky and persistent hairs.

The root stocks extend along about four inches below the surface of the ground. Great numbers of new plants shoot up from the root stocks.

The Annual Sow Thistle is sometimes mistaken for Perennial Sow Thistle. As the term would indicate, it is an annual plant. Its roots are fibrous. It has no underground root stocks. The stems are nearly simple, one to four feet high. They are very slightly branching and covered with coarse hairs. The leaves are deeply notched, each leaf being terminated by a large lobe. The base of the leaves clasp the stem with two sharp points. The flower is pale yellow, and smaller than in the case of the Perennial Sow Thistle. It is about one-half an inch to one inch in diameter. The seed is somewhat smaller. It is a little shorter, flattened and pointed at the basal end. The longitudinal ridges are wider apart, much finer, and the whole surface of the seed, the ridges as well as the interspaces, is finely wrinkled transversely.

Perennial Sow Thistle occurs in towns and cities, in vacant lots, on refuse dumps, in lumber yards, along the streets, on banks of rivers and streams, in stock yards, in railway yards, in gardens, around stations, elevators and loading platforms. In fact, in many towns and cities it is to be seen in every direction.

It is abundant in many of our cultivated fields, along roadsides, in wooded areas, around lakes, on abandoned farms, on reserves and school lands, along irrigation ditches, in the foothills, on ranch lands, in nurseries, in cemeteries. In 1913, Perennial Sow Thistle was reported at one place only in Alberta, a short distance east of Medicine Hat. Now it is to be found in almost every district over the entire Province.



PERENNIAL SOW THISTLE
(*Sonchus arvensis*, L.)

If Perennial Sow Thistle becomes established, it is one of the most difficult weeds to eradicate.

The following methods of eradication have proved effective:

(a) Dig out the roots: If the patches are quite small, as they usually are when the weed makes its first appearance, they can be dug out and the roots burned. Such areas have to be watched constantly for appearance of new plants, which also should be dug out at once. Exercise caution that all roots are obtained and destroyed.

(b) Cover with a good grade of tar paper. Where the patch is small, level it off with a spade for a distance of four to five feet all around it. Then lay tar paper down, overlapping the layers from six inches to half the width of the strips of paper. Cover the tar paper with a layer of dry sods, closely laid together, and over this two to three inches of fine loose earth. The object of doing this is to cut off air and sunlight. Care must be taken to level the ground, so that there are no lumps or stalks left to penetrate the paper, and so that the paper can lie snugly. The covering should be left in place for two years, and repaired if damaged.

(c) Oil: Numerous experiments have been conducted during recent years with used oil from the crank case of motors and also with fuel oil. The application of oil to Perennial Sow Thistle patches has proven effective in certain districts in the Province, particularly on loose structured soils. On gumbo soils, or soils of a heavy clay nature and very compact in structure, the results with oil are not as satisfactory. To get the best results it is advisable to select a hot dry day, with the ground as dry as possible. The reason is that dry earth absorbs the oil more readily. The heat from the sun thins the oil, causing it to penetrate the ground more readily. Remove all growth, and if the surface is very hard and caked, it is advisable to chop or loosen it up somewhat, in order that the oil will the more readily soak in to the roots. Apply the oil at the rate of two gallons per square yard, then in about two weeks give another application of one gallon per square yard. A single application of three gallons per square yard is not as effective as the two applications. The patch should be watched; and if any plants show up, oil should be applied. The even application of oil is essential. This can be done by spraying. It is necessary to apply enough oil to soak down to the root stocks, which are about four inches beneath the surface.

Applications of oil can be used advisedly on patches found among trees, rocks, around shores of lakes, or other places where other methods prove futile.

(d) Hoeing: Small patches, if hoed deeply once a week, will eventually destroy Perennial Sow Thistle. No young plants should be allowed to appear. This method may require two years.

(e) Pulling: Continued pulling of the plants will weaken the Sow Thistle and doubtless kill a few. This method cannot be recommended except as a control method. It is doubtful if complete eradication can be effected in this way.

(f) NEVER ALLOW THE PLANT TO SEED. Seeds will travel before the wind for miles, and pollute fresh areas.

(g) Cultivation: For large tillable areas, eradication by cultivation is the only recommended method for eradication of the Perennial Sow Thistle.

To do this, plow four to five inches deep just before freeze up in the fall. The land is left rough all winter. The frost attacks, weakens, and kills many of the exposed roots. As soon as the weed starts in the spring, the land should be cultivated once every week with a wide-toothed duck-foot cultivator with well-sharpened teeth. NEVER LET A SINGLE PLANT APPEAR ABOVE THE SURFACE. The reason why the thistle is often not completely eradicated in one season's cultivation is because cultivation was not frequent enough to keep down all growth. If the land is kept black throughout the spring, summer and fall, complete eradication will be effected in one year.

If a few large patches exist in a field, it is better to cultivate each patch separately before going over the whole field; otherwise there will be danger of trailing roots on to clean parts of the field. Work around the patches, and in towards the centre.

Any roots that are brought to the surface, as the result of cultivation, should be gathered and burnt.

Black summerfallow is the one standard method to be recommended for the eradication of Perennial Sow Thistle.

Effect of Perennial Sow Thistle on other crops: While crops such as Brome Grass or Alfalfa will have a tendency to keep Perennial Sow Thistle in control, the writer has witnessed the complete choking out of these crops by the thistle in a very few years. As far as we know now there is no cultivated crop that will crowd out this weed.

Chemicals: Various chemicals besides oil are being experimented with, but with very little success. It is hoped that in the near future this weed, as well as others, may be eradicated by the use of chemicals.

CANADA THISTLE

(*Cnicus arvensis*, L.)

Perennial, introduced from Europe. Deep running root stocks, which extend along below the surface of the ground and parallel to it. These send up new plants every few inches. Stems erect, two to four feet high. Leaves are narrow, deeply pinnatifid, waved and crested, clasping the stem slightly at the base, very prickly, dull green color, a smooth glossy appearance on the upper side while the under surface is greyish, being covered with a fine down. Flower heads are numerous, in a large loose corymb at the top of the stems. Flowers vary in color, ranging from pale purple through shades of pink to white. There are two kinds of flowers, viz.: male flowers which form no seeds, and female flowers which form seeds. The former are about one inch across, while the latter are only half the size. The impression that the color of the flower denotes sex is not accurate. The difference in color is merely a genetical one.

The seed is one-eighth of an inch long, light brown, elongated, oblong, smooth, somewhat flattened and curved, marked with faint longitudinal lines. The top is nearly round, flat, and has a narrow rim with a small cone-shaped point in the centre. Attached to the rim is a copious white feathery pappus, easily detached if disturbed. This downy substance aids the seed to drift through the air for long distances. It flowers from June to September.

Eradication:

(a) Dig out the roots. If the patches are small, the roots may be dug out with a spade. One or two operations are usually sufficient. Close watch must be kept for straggling plants, which should be treated promptly in the same manner.

(b) Keep the thistles thoroughly cut with a hoe every few days throughout the growing season. Never allow a single plant to appear above the surface of the ground. It may take two seasons to completely eradicate the weed in this way.

(c) NEVER LET THISTLES GO TO SEED.

(d) Spudding will prevent seeding. Consolidated patches should be cut with a scythe, or mowed, if there is danger of seeding. If the seed is liable to mature after cutting, rake and burn, or preferably scatter straw on the patches that have been cut and burn when dry.

(e) Cover with tar paper. Where the patch is small, level it off with a spade for a distance of two to three feet all around it. Then lay tar paper down, overlapping the layers from six inches to half the width of the strips of paper. Cover the tar paper with a layer of dry sods closely laid together, and over this two to three inches of dry dirt. The covering should be left in place for two years, and repaired if damaged.

(f) Oil: Fuel oil or used oil from the crank case of motors if applied in sufficient quantities to saturate the ground well down to the underground root stocks will with one application of three gallons per square yard kill most of the thistles. If any stray plants show up afterwards they should be dug out or treated again with oil. Oil for Canada Thistle patches can be recommended only where other methods of eradication are not practicable. The oil will kill all other vegetation besides the thistles. The application of oil on Canada Thistle patches is particularly effective in those districts where the soil is of a loose structure. On gumbo soils or soils of a heavy clay nature and very compact in structure the results with oil are not as satisfactory. To get the best results it is advisable to select a hot dry day, with the ground as dry as possible. The reason is that dry earth absorbs the oil more readily. The heat from the sun thins the oil, causing it to more readily penetrate the ground. Remove all growth, and if the surface is very hard and caked, it is advisable to chop or loosen it up somewhat, in order that the oil will the more readily soak in to the roots.

(g) In cases where large areas are infested, the above methods are impracticable. The following methods of eradication have been found effective:

(1) Plow deep to get below the roots just before freeze up in the fall. The land is left rough over winter. The frost will weaken and kill many of the exposed roots. As soon as the weed starts in the spring the land should be cultivated with a duck-foot cultivator once every week until well into the fall. NEVER ALLOW A SINGLE PLANT TO APPEAR. This method will completely eradicate Canada Thistle in any kind of soil in one year.

If there are patches in a field, care must be exercised during their cultivation not to drag thistle roots over the clean portion of the field. Never pass harrows, for instance, through the patches and proceed over the clean part of the field. The thistle patches should be cultivated separately.

(2) Plow shallow just to get below the roots immediately after harvest. Cultivate until late in the fall with a duck-foot cultivator. Continue this cultivation in the spring until June; then plow deep, work well, and seed thickly to barley. If this system of cultivation is followed for two years, it will practically eliminate the thistle, particularly in the case of minor infestations.

(h) To simply cut when the stems are hollow, or when the plant is in full blossom, is ineffective. However, the roots are then at their weakest stage and if plowed at once and cultivated regularly till freeze-up, allowing no thistles to appear at any time, it will thin out many of them. Usually, it will be necessary to continue cultivation with the duck-foot cultivator in the spring until July or August. The land will then be in excellent condition for Fall Rye or Fall Wheat. A short crop, such as barley, might safely be seeded in June. After the barley is harvested, plow and cultivate as before till winter if any thistles showed up in the crop.

The *rod-weeder* is an implement that has to a certain extent replaced the duck-foot cultivator on many farms. It can be recommended for land that is in a good state of cultivation, free from sod, stones, roots, etc. The teeth of the duck-foot cultivator must



CANADA THISTLE
(*Cnicus arvensis*, L.)

be kept sharp, otherwise very unsatisfactory results will be obtained. Use wide teeth on the cultivator.

(i) Road sides, head-lands, and fence lines too frequently are left uncut, with the result that all kinds of weeds, including thistles, go to seed and pollute adjoining farms. This should not be permitted. It will make clean farming an impossibility, and is contrary to the provisions of The Noxious Weeds Act.

(j) With the exception of oil, no chemical has yet been discovered that will eradicate this weed. Salt has been advocated, but the writer is unable to recommend its use.

(k) On irrigated land, seeding down to alfalfa will in a few years clean up a field infested with Canada Thistle.

(l) Seeding down to Brome: The dense root system of Brome will in four to five years choke out practically all Canada Thistle. The continued use of Brome in the rotation has proved effective in the control of the weed.

(m) A rotation of crops consisting of cultivated crops (such as field roots, corn and sunflowers) alfalfa, sweet clover, and perennial grasses, will keep the weed in check and prevent the existence of densely consolidated patches. Straight grain-growing will eventually produce a very weedy condition; and unless black summerfallow is resorted to, under that system of farming Canada Thistle will come in, and in time be responsible for heavy losses.

BLUE LETTUCE

(*Lactuca pulchella*, D.C.)

Native. A deep rooted perennial with underground root stocks. From the root, and also from the root stocks, fresh stems are sent up. During the flowering season it is doubtful if it sends up stems from the running root stocks, though it does from the base of the original stem, even without being cut off; and when cut below the crown, two or more stems soon arise to take the place of the one that was cut away. Stems two to three feet high and leafy below; whole plant smooth and covered with a fine bloom, filled with milky juice. Leaves variable, linear lance-shaped, or oblong; without teeth or divisions, or sometimes dentate or pinnatifid, the divisions directed backward; stem leaves less divided and stalkless. The flower heads are nearly one inch across, and pale blue in color. The flowers are borne in panicles at the top of the plant, and are not very numerous.

The seed is about one-quarter inch long, including the short thick beak, the tip of which is whitish, expanded into a short, cup-shaped disk, red when immature, slaty-grey when ripe; club-shaped, flattened with thick ridges down each face; whole surface dull and rough; pappus long, white, and silky.

It flowers from June to July, and the seed is ripe in August.

It propagates by seeds, and deep persistent running root stocks.

It occurs on railway grades, irrigation ditches, in grain fields, on roadsides, etc. It is generally found in patches. This plant is increasing very rapidly in the Province. Large patches are frequently seen growing in grain fields that have completely choked out the grain.

While Blue Lettuce is not so difficult to eradicate as Canada Thistle or Perennial Sow Thistle, it should be eradicated as soon as noticed; or it will be, in a short time, the cause of greatly reduced yields.

The following methods of eradication are recommended:

(a) NEVER ALLOW IT TO GO TO SEED. Keep it cut when found around edges of fields, and along roads, railway rights-of-way, and waste places.

(b) Dig out small patches. Collect and burn the roots, and then hoe at intervals.

(c) Fall plowing just before freeze-up, if done deep and left rough over winter, will sometimes completely eradicate the weed and will always greatly thin it out. Seldom is complete eradication effected in this way.



BLUE LETTUCE
(*Lactuca pulchella*, D.C.)

(*d*) Late spring plowing, followed immediately with a heavy seeding of barley in June, will eradicate many of the plants.

(*e*) The black summerfallow, as recommended for the eradication of Canada Thistle, will completely eradicate it.

(*f*) Blue Lettuce becomes extinct in an intertilled crop, providing the crop is kept well cultivated.

(*g*) It is readily choked out by seeding down to Brome, Western Rye, Alfalfa, Timothy, and very often by Sweet Clover.

N.B.—All the methods employed for the eradication of Canada Thistle will, without doubt, get rid of Blue Lettuce. It follows that plowing should take place before the weed goes to seed, and that it must be watched and cultivated afterwards, keeping it black at all times if positive and rapid eradication is to be expected.

WILD OATS

(*Avena Fatua*, L.)

Annual, of European origin. Introduced into the West from Eastern Canada and United States. Plants grow from two to four feet high, and closely resemble some varieties of cultivated oats. The panicle is very spreading, and from six to twelve inches long.

The seeds vary in size and color very greatly; there being all shades of brown, black, grey, and yellow. They are generally slimmer and harder than cultivated oats. They are easily recognized by the peculiar sucker mouth or horseshoe-shaped scar at the base of the seed, and also by the stiff bristles surrounding the basal scar, which, however, are not always present in threshed grain. Wild Oat seeds usually have a strong twisted right-angled dorsal awn, frequently broken off by threshing.

Wild Oats propagate by seed only. They will often stay in the ground for many years, and then germinate when brought near the surface. They retain their vitality longer than cultivated oats. The seeds on the upper part of the head and on the tips of the branches ripen earlier than those less exposed. The earlier seeds are dropped before or during harvest. The later maturing seeds are harvested with the crop, and remain in commercial wheat, oats, and barley. The continuous growing of cereal grains is, therefore, conducive to pollution from Wild Oats.

The loss in Western Canada annually due to Wild Oats is enormous and is rapidly on the increase.

The following methods of control and eradication have proved effective:

(a) Sow clean seed. The value of clean seed cannot be overestimated. Too often do we find farmers sowing Wild Oats through their drills. The average fanning mill will not take all Wild Oats out of wheat. It is absolutely impossible to remove all of them from oats and barley. An indent machine is the only machine with fair capacity that will make a complete separation from wheat. The discreet and far-seeing farmer will buy clean seed rather than sow a single Wild Oat. Wild Oats multiply with tremendous rapidity.

(b) Skim-plow two or three inches deep in the fall immediately after harvest to turn under the Wild Oats. A small number will grow in the fall. Many others will start the following spring, and be destroyed by cultivation before sowing the crop. Seeding to green feed, such as oats, is advisable; providing the green feed is cut before the Wild Oats ripen.

(c) Double-disking in the fall behind the binder is good for the same reason as skim-plowing. Skim-plowing is generally admitted to be better than diskings.



WILD OATS
(*Avena Fatua*, L.)

(d) If the land has been skim-plowed in the fall and the plants destroyed the following spring by cultivation, it would be unwise to plow the land before seeding as a fresh supply of Wild Oats would be brought up, which would grow with the crop of grain; the idea being to get the top three inches of soil as free from Wild Oats as possible.

(e) Spring cultivation with a disk should be done early to get the Wild Oats to germinate. Plow five to six inches deep about the 10th of June, harrow and cultivate several times to destroy fresh growth of Wild Oats until July 15th. Then seed to Fall Rye, which can be pastured that fall and the next spring.

(f) Double disk in the fall, then plow deep fairly early in the spring. Work well till late in June; then seed thickly to barley or oats. Cut for green feed before any Wild Oats ripen.

(g) After having skim-plowed or double-disked in the fall or in the early spring, plow the usual depth for summerfallow early in June. Harrow down at once. Cultivate, using a spring-toothed harrow, or a duck-foot cultivator, every two weeks till September 1st. Each cultivation should be deeper, until the bottom of the furrow slice is reached, if possible. This has a tendency to bring up for germination more Wild Oats. Do no fall cultivation. If there is any fall growth it is preferable to pasture it. Without cultivation, put the drill on first thing in the spring, and seed to wheat or oats. Late fall or early spring cultivation is liable to bring up more Wild Oats, which will germinate ahead of or at the same time as the grain. Summerfallow may be resorted to every other year to clean up a badly infested field.

(h) Timothy, Western Rye, Brome, or a grass mixture is often seeded with the wheat or oats on land that has been summerfallowed. Leave down to grass for several years, and pasture or take the hay off. The longer it can be left down profitably to grass the better, to allow Wild Oats to decay. If Brome becomes sod bound, severe double-disking will thin it out, producing a stand with greater length of straw. Old alfalfa stands on irrigated land seldom show any Wild Oats when broken. Sweet Clover for pasture or hay is also a good cleaning crop, as many Wild Oats come up and are pastured off or cut for hay before ripening.

(i) Hoed crops on land worked from early spring, if well cultivated during the growing season, are recommended for Wild Oat eradication.

(j) Screenings or grain containing Wild Oats should not be fed to livestock with the exception of sheep, without first being ground or cooked. Work-horses are often responsible for clean land becoming polluted with Wild Oats, and the farmer wonders why his crop is weedy. Threshing machines and bundle racks should be thoroughly cleaned out and swept off before moving. All screenings left after threshing should at once be lifted or burnt. Hogs and other livestock running at large eat them; and as a result of imperfect digestion, Wild Oats will be spread wherever they roam.

WILD MUSTARD

(*Brassica arvensis*, L., otherwise
Brassica sinapistrum)

Other English names: Charlock, Field-kale and Ontario Mustard.

Annual, introduced from Europe. Stems erect, branching, one to three feet high, rough, with stiff, somewhat downward directed hairs. The purple at the junction of the branches with the stem is a striking characteristic. Lower leaves stalked, usually deeply indented or lobed, with the terminal lobe large; upper leaves mostly stalkless. Roots fibrous. The flowers are yellow, showy, and about two-thirds of an inch across. Seed pods are from one to two inches long, slightly constricted between the seeds, ribbed, and rising obliquely on short thick foot stalks, tipped with a long empty beak, which breaks away whole from the ripe pod. Each contains about fifteen to seventeen seeds. A strong plant will produce ten thousand seeds.

The seeds vary somewhat in size, but are generally one-sixteenth of an inch in diameter, quite round, dark brown, or reddish black, and almost smooth.

It flowers from June to September. Seed ripens by August.

It propagates entirely by seed.

It is general throughout the Province, and particularly in the park and forest areas.

Wild Mustard is a very harmful weed. It absorbs large quantities of moisture. Its numerous seeds have great vitality, and have been known to lie in the ground for many years, and grow when brought near the surface into conditions favorable for germination.

Eradication:

(a) Sow clean seed. Any good fanning mill should remove all seeds from cereal grains.

(b) Feed clean grain particularly to work-horses. Excess of mustard seeds is injurious to the health of animals. If fed to hogs and cattle, grain containing Wild Mustard should be ground to kill germination.

(c) Hand-pull stray plants. A man at each side of a wagon can go through a grain field and clean up a large acreage of grain containing scattered plants. Pile and burn when dry.

(d) Plant a hoed crop on areas badly polluted, or seed to rape and pasture off with sheep.



WILD MUSTARD

(*Brassica arvensis*, L., otherwise
Brassica sinapistrum)

(e) When fields are badly overrun, the following methods of eradication are recommended:

(1) Disk after the binder to cover the seeds. If there is moisture many will germinate in the fall, and can be eaten off by sheep or destroyed by frost.

(2) Shallow skim-plowing is also recommended; it makes a better job of covering the seeds. Plow immediately after harvest and harrow at once.

(3) Harrow the growing crop two to three times until six inches high, to pull out young plants. Seed a little heavier to make up for loss sustained by harrowing. It is well to give one harrowing across the field and the others lengthwise.

(4) Fall-disk or skim-plow, then cultivate early in the spring to induce further germination. The drag-harrows can be used to good advantage, although the duck-foot cultivator will do equally well and is a better general weed destroyer. About June 1st plow five to six inches deep and seed to barley. After the barley is harvested, cultivate immediately, and follow the same procedure next year. Should there be danger of mustard ripening with the barley, cut the barley for green feed.

Instead of seeding to barley immediately after plowing, harrow once, and later cultivate once, and sow heavily to green feed from June 15th to July 1st. The resultant crop will mature ahead of any mustard plants.

(5) Having given good fall and spring surface cultivation as above indicated, plow deep for summerfallow in June and harrow behind the plow. Cultivate the summerfallow frequently throughout the summer to keep it black, using a duck-foot or spring-tooth cultivator, going a little deeper each time to bring up more seeds and to cut off young plants. If there is no danger of soil drifting, the occasional harrowing and cross-harrowing of the summerfallow, with the teeth set to go as deep as possible, will pull out young plants and bring more seeds to the surface. Harrowing, however, will not replace absolutely the duck-foot or spring-tooth cultivator. The rod-weeder destroys young plants, but will not bring up seeds to the surface as well as one of the above cultivators. If the summerfallow will drift because of intensive cultivation, sheep will eat off all growth and pack the land.

(6) The following spring after summerfallow, seed to oats or wheat, harrow the growing crop once or twice and harrow in Timothy or other perennial grasses or mixtures. Leave down to hay or pasture for several years.

(7) Chemicals: Spraying once or twice with a solution, made up of from 75 lbs. to 100 lbs. of iron sulphate to 50 gallons of water, will destroy Wild Mustard, and is to be recommended on those areas where cultivation is not practicable.

BALL MUSTARD

(*Neslia paniculata*, L.)

Annual weed, introduced from Europe into the West. Sometimes a winter annual. Stems erect one to four feet high, very slender. Strong plants throw out a few long branches. Whole plant a yellowish green, and is covered with small fine hairs. Lower leaves lance-shaped and narrowed at the base; stem leaves arrow-shaped clasping the stem at the base, blunt, pointed. Flowers orange yellow and one-eighth of an inch across. The seed pods are round, borne on the end of short slender stems. They are greenish yellow when ripe and do not shed their seeds readily. Each pod contains only one seed which is of a pale yellow color. Seeds somewhat difficult to clean out of grain because of their size. An experienced fanning mill operator with proper screens can make a perfect separation.

Ball Mustard flowers from June to August, and seeds ripen from July to September.

It occurs in grain fields, on railroads, earthworks, and in waste places.

It propagates by seed.

The following methods of eradication are recommended:

(a) Sow clean seed.

(b) All grain fed to livestock, with the exception of sheep, should be clean or finely crushed. Manure containing weed seeds should be well rotted before applying to the land.

(c) Skim-plow or disk in the fall immediately after harvest. Harrow after the plow. Many seeds will sprout in the fall. Sheep relish the young plants.

(d) If skim-plowing in the fall or fall disking has not been done, disk early in the spring. Plow about June 1st, and seed to barley; or cultivate after plowing two weeks later, then harrow and seed to green feed on July 1st.

(e) If the land has been cultivated in the fall, spring plow early and seed to wheat or oats. Harrow the growing crop two to three times when it is from three to six inches high.

(f) Seeding to grass for three or four years will greatly reduce the weed.

(g) Hand-pull scattered plants.

(h) Fall or spring cultivation, followed by a hoed or cultivated crop. Such crop should be cultivated well and often, being certain not to allow any plants to go to seed.



BALL MUSTARD
(*Neslia paniculata*, L.)

(i) Badly infested areas should be summerfallowed. Fall or spring cultivation should be followed by deep plowing about the 1st of June, keeping the summerfallow well worked, till freeze-up, will give desired results.

(j) The following spring, after seeding to wheat or oats, harrow once or twice when the crop is from three to six inches high. At the time of the last harrowing sow Timothy or other perennial grasses.

(k) Chemicals. Treatment with iron sulphate solution as for Wild Mustard will destroy the weed.

RUSSIAN PIGWEED

(*Axyres amarantoides*, L.)

Annual, introduced from Europe. A tall, coarse plant, from two to four feet high, erect, widely branching and very leafy. Pale green color. Flowers quite small and pale yellow in color. The plant when mature is of a light golden color. The stems turn almost white.

The seeds are oval, flattened, half an inch long, grey or brown with a silky lustre, surface minutely lined and wrinkled lengthwise, basal scar a short thin groove across the lower end.

It occurs in small patches throughout the Province, along railroads, sides of roads, feeding yards, etc. Several districts report it to be bad in their grain fields, and their hardest weed to control. It propagates by seed.

Eradication:

(a) Keep road allowances, edges of fields, and waste places clean.

(b) Pull, pile in heaps and burn. A single plant will produce as many as twenty-five thousand seeds.

(c) Harrowing the crop two or three times, after it is up three inches, will destroy many plants.

(d) Seed down for four or five years with a permanent grass mixture. The weeds should be kept cut until the grass has taken complete possession of the soil.

(e) Fall cultivation right after harvest will start many seeds which will be destroyed by the frost.

(f) Badly infested fields should be spring cultivated early and then thoroughly summerfallowed and the succeeding crop harrowed several times.

(g) Potatoes, corn, and other hoed or cultivated crops, if kept clean, will do much to rid the soil of the pest.

(h) Sheep eat the young plants readily.

(i) Cutting will not kill the plant. New, fresh shoots will at once come up. Pulling, hoeing, or cultivating out is necessary for its destruction.

(j) Clean up after the threshing machine. Screenings containing seeds of this plant should be fanned to take the seeds out, which should be burnt. There is little feed value in Russian Pigweed seeds, and very few at any time should be fed.

(k) The threshing machine and bundle racks should be thoroughly cleaned out and swept off before moving.



RUSSIAN PIGWEED
(*Axyres amarantoides*, L.)

STINKWEED

(*Thlaspi arvense*, L.)

Also called Penny Cress and French Weed

Introduced from Eastern Canada. Annual and winter annual of European origin. The plant grows from six inches to two feet high. The plant is erect, with numerous branches arising from the upper part. When young it is a dark green color, changing to a golden yellow, or whitish, at maturity. It has a disagreeable and characteristic odor. One plant will produce from sixteen hundred to fifteen thousand seeds.

It is found in most districts in Alberta, occurring particularly in the older settled parts. It is brought in with feed, seed, hay, machinery, wind, livestock, and settlers' effects.

It flowers from April to late in the fall.

Eradication:

(a) Stray plants should be pulled and immediately burnt. Seeds that are extremely small and green will mature and grow if covered with soil.

(b) Sow clean seed.

(c) Grain, before being fed to livestock, should be fanned to take Stinkweed out. Any good fanning mill, with one operation, provided it is not crowded too fast, will clean all Stinkweed out of cereal grains. There is no feed value in Stinkweed seeds. Never feed unground to livestock except sheep. Manure should be thoroughly rotted before hauling on to the land.

(d) On road sides and waste places scatter straw and burn, or use a weed burner. This is better than mowing, raking and burning, particularly if the plants have set seed. They will then shatter; and many will not be burnt, but be left to produce new plants. Straw can be scattered deep on fairly green plants. Burning will destroy them.

(e) Straw stacks with Stinkweed in them should be burnt or fed on the ground. The livestock should be confined to the field that produced the weeds.

(f) Cultivate after the binder to start germination. A second cultivation may be necessary if the fall is wet; small rosettes are liable to appear and, the weed being a winter annual, these should be cut off. The following spring, surface cultivate; and in about two weeks plow shallow and harrow down at once. Fall plowing is ill advised for Stinkweed. It is liable to cover too deeply. Small seeds should be lightly covered.

(g) Harrow the grain two to three times when from three to six inches high. Cross harrow at least once.

(h) Fall surface cultivation should be followed by early spring cultivation. The plant is a winter annual, and those that live over winter need to be destroyed not later than April. Plow for summer-fallow by June 1st. Harrow after the plow, and with the use of a duck-foot cultivator, spring-tooth harrow or rod-weeder, keep the summerfallow black till freeze-up. Keep going a little deeper with each cultivation to bring up more seeds to be germinated. Pull all plants that the cultivator fails to get and burn them at once. Do not leave them lying around.

(i) Surface cultivate early in the spring and repeat as often as necessary to prevent the plants from forming seed pods. Plow on June 1st and harrow down at once. Keep black until July 15th to August 1st, and sow to fall rye and pasture that fall and next spring. Pull and burn any Stinkweed plants that the stock have missed and which have developed to the flower stage. Then plow about June 1st and keep well cultivated and seed again to rye for pasture in the fall and early spring. The rye later can be harvested. After harvest, plow and keep black the rest of the fall. The land will be in good shape for wheat or oats next spring.

(j) When plowing land with Stinkweed on it, be sure to cover every plant completely. As a matter of fact, this applies in case of all weeds. Careless or poor plowing, leaving weeds sticking up here and there is bad practice. Many of these weeds will continue to mature instead of being rotted and incorporated into the ground. Plow before any seed pods have appeared.

(k) Too often do we find farmers allowing Stinkweed to grow and form pods. Then they plow these plants under. This is simply storing up more trouble; as, no matter how small the seed may be, it will mature and produce a new stand when plowed under. In cases such as this, scatter plenty of straw on the plants and burn. This will destroy the germinating power of any seeds that have set. The weed burner also does excellent work on such areas.

(l) On land that has been well worked all spring, seed to green feed about July 1st, and cut before any Stinkweed pods are produced. Barley can be seeded heavily about June 15th; and if harrowed once or twice when high enough, may mature a clean crop. At any rate, it can be cut for green feed.

(m) On the prairies many farmers cultivate in the fall with the disk, then cultivate again in the spring, and summerfallow in June for the rest of the season. They do this every alternate year. Harrowing the growing crop is considered good business. In this way land badly infested with Stinkweed is in a few years cleaned up.

(n) Spring cultivation, followed by a hoed or cultivated crop, is almost as effective as summerfallow.

(o) Badly infested areas should be put into grass such as Timothy, Brome, and Western Rye, or any recommended grass and clover mixture. To do this, fall cultivate and plow early in spring, and seed rather thinly to oats, which should be harrowed a couple of times when high enough. Then harrow in the grass seed. Or, during the spring after summerfallow, do further cul-



STINKWEED
(*Thlaspi arvense*, L.)

tivation until well into May and then seed to oats and grasses as above. Cut the resultant crop for green feed if any plants of Stinkweed are apt to set seed. The hay, the next year, should be cut two to three times if possible. The following year pasture, and be constantly on the look out for any plants that the stock have missed, and as soon as they come into flower, pull and burn them. The hay crops of succeeding years should be clean. Leave down to grass for at least five years. Seeding down is very largely a control measure. While a large number of Stinkweed seeds will be destroyed in one way or another during the 5-year period, when the sod is broken more plants of Stinkweed will, in all probability, show up.

N.B.—Those wishing information on weeds not specifically dealt with in this bulletin should communicate with one of the following: the Field Crops Branch, Department of Agriculture, Edmonton; the Agronomist at the nearest Provincial School of Agriculture; the Field Supervisor; or the Local Weed Inspector.

